Statewide Initiatives and Emission Reduction Strategies

Early Action Compact Milestone December, 2003
List of Emission Reduction Strategies Under Consideration
Bureau of Air Quality – DHEC
State of South Carolina

Based on stakeholder consultation and taking into consideration resource and political constraints, the following control measures under consideration can be reasonably implemented. It is anticipated these measures under consideration will assist South Carolina in achieving and/or maintaining the 8-hour ozone standard by 2007 and beyond.

Measure under Consideration	Detailed description of measure	Current assessment of emission reductions	Proposed date for implementation	Geographic area and/or local government
Ozone Forecast/Outreach and Education	The Division of Emissions, Modeling and Support develops a forecast for the 8-hour ozone standard. The forecast is for four areas within South Carolina. These areas include the Upstate, Central Midlands, Central Savannah River and Pee Dee. The Catawba area, including Chester, Lancaster and York counties is included in North Carolina's forecast through a cooperative partnership. A link for the Catawba forecast is included on DHEC's website. This year, 2003, was the first year that South Carolina forecasted for the Pee Dee area. The Division of Air Planning, Development and Outreach is responsible for disseminating the ozone forecast to interested individuals and groups across the state, primarily during the summer months. The forecast serves as a public health advisory to protect those persons who are most at risk to the effects of ozone.	Directionally Sound	Ongoing	Forecast Areas: Upstate area - Anderson, Oconee, Pickens, Greenville, Abbeville, Laurens, Greenwood, Spartanburg, Cherokee, and, Union counties. Central Midlands area – Newberry, Fairfield, Kershaw, Lexington, Richland, Calhoun, Kershaw, and, Sumter. Central Savannah River area – Allendale, Barnwell, Aiken, Saluda, Edgefield, and, McCormick. Pee Dee area – Lee, Darlington, Florence, and, Chesterfield
Support activities implemented by local areas participating in the EAC	SC has been and will continue to work with EPA to assist local areas in determining the emission reduction strategies that will assist the area in achieving emission reductions needed for attaining and maintaining the 8-hour ozone standard within their respective area. The Division of Air Planning, Development and	Directionally Sound	Ongoing	Statewide

Refer to the December 2003 Progress Reports submitted by individual areas for additional activities.

Measure under Consideration	Detailed description of measure	Current assessment of emission reductions	Proposed date for implementation	Geographic area and/or local government
	Outreach continues to develop a Resource Guide for Air Quality Improvement that contains useful information to assist counties in planning for cleaner air sooner. This guide is a work-in-progress in which DHEC will continue to search for new information and ask that any information gathered and/or found by counties be shared so that it can be added and used for the benefit of everyone. This guide consists of informational text, pamphlets, hand-outs, useful websites, and other resources that will serve as a tool for county planning. Fact sheets have either been developed or revised to assist with understanding ozone, ozone monitoring and the ozone design value. Copies of these fact sheets were included in the June 2003 submittal. Forms for the milestones have been developed by the Division and provided to the participating areas to assist with the reporting aspect of the EAC. These forms were approved by EPA and were shared with other states involved in the EAP process.			
Open Burning	Revise the existing state regulation (R.61-62.2, Prohibition of Open Burning) to reduce statewide NOx/PM/CO emissions. The DHEC Board granted initial approval of the proposed regulation on October 9, 2003. An informational forum was held on November 24, 2003. Final approval by the DHEC Board will be requested January 8, 2004, for submittal to the state legislature.	Currently Evaluating	Promulgation should occur by June 2004. Implementation expected by 2005.	Statewide
South Carolina NOx Control Regulation	This proposed regulation is designed to help control the growth of NOx emissions statewide and focuses on sources currently not subject to NOx control requirements. This proposed regulation would apply to new NOx sources but would exempt units that are regulated by other NOx regulations with equivalent requirements. The DHEC Board granted initial approval of the proposed regulation on October 9, 2003. An informational forum was held on November 24, 2003.	Currently Evaluating (See Attachment 1)	Promulgation should occur by June 2004. Implementation expected by 2005.	Statewide

Refer to the December 2003 Progress Reports submitted by individual areas for additional activities.

Measure under Consideration	Detailed description of measure	Current assessment of emission reductions	Proposed date for implementation	Geographic area and/or local government
	Final approval by the DHEC Board will be requested January 8, 2004, for submittal to the state legislature.			
CAIGE	Develop, implement and market a plan for reducing ground-level ozone precursors by state government.	Voluntary efforts Directionally Sound	April 2005	Statewide
Smart Highways	A plan to ensure transportation plans, programs and projects consider statewide and local air quality goals. Certain aspects of the Transportation Conformity regulations may be incorporated into such a plan.	Not applicable		Statewide
Initiative to reduce NOx emissions from large facilities within South Carolina	Staff within the Bureau of Air Quality, have met with some of the "larger" facilities in South Carolina to negotiate NOx emissions through the permitting process. Those reductions will be made available once they are finalized.	Currently Evaluating	April 2005	Statewide
Tier 2 standards	Federal emission standard for passenger cars, light trucks, and larger passenger vehicles. Program designed to focus on reducing the emissions most responsible for the ozone and particulate matter impact from these vehicles, including NOx and VOCs.	Currently Evaluating (See Attachment 2)	Phase in period 2004-2007	Statewide
Low Sulfur	Program to reduce average gasoline sulfur levels nationwide	Currently Evaluating (See Attachment 2)	Phase in period 2004-2007	Statewide
NOx SIP Call	Federal Rule calling for SIP revision that requires sources in 17 states, including South Carolina to reduce summertime NOx emissions.	18 percent reduction in NOx (See Attachment 2)	2004	Statewide

Refer to the December 2003 Progress Reports submitted by individual areas for additional activities.

Estimated Reductions Achieved by NOx Control Standards from Uncontrolled Levels

Source Type	**Control Technology and/or Emission Limit**	**Percent Reduction from Uncontrolled**
Boilers and Water Heaters		
Natural Gas Fired Boilers		
≥10mmBTU/hr and < 100mmBTU/hr	Low NOx Burners or equivalent technology capable of achieving 30ppmv @ 3% O2 Dry (0.036 lb/mmBTU)	50%[1]
≥100mmBTU/hr	Low NOx Burners + Flue Gas Recirculation or equivalent technology capable of achieving 30 ppmv @ 3% O2 Dry (0.036 lb/mmBTU)	50- 60%[1]
Distillate Oil Fired Boilers		
≥10mmBTU/hr and < 100mmBTU/hr	Low NOx Burners or equivalent technology capable of achieving 0.15 lb/mmBTU	50%[1]
≥100mmBTU/hr	Low NOx Burners + Flue Gas technology capable of achieving 0.14 Recirculation or equivalent lb/mmBTU	60%[1]
Residual Oil Fired Boilers		
≥10mmBTU/hr and < 100mmBTU/hr	Low NOx Burners or equivalent technology capable of achieving 0.3 lb/mmBTU	50%[1]
≥100mmBTU/hr	Low NOx Burners + Flue Gas Recirculation or equivalent technology capable of achieving 0.3 lb/mmBTU	60%[1]

Refer to the December 2003 Progress Reports submitted by individual areas for additional activities.

Multiple Fuel Boilers		The emission limits for boilers burning multiple fuels are calculated in accordance with the formulas below. Additional fuels shall be addressed on a case-by-case basis.
≥10mmBTU/hr and < 100mmBTU/hr	$E_n = [(0.036 \text{ lb/mmBTU } H_{np}) + (0.15 \text{ lb/mmBTU } H_{do}) + (0.3 \text{ lb/mmBTU } H_{ro}) + (0.35 \text{ lb/mmBTU } H_c) + (0.2 \text{ lb/mmBTU } H_w)]/(H_{np} + H_{do} + H_{ro} + H_c + H_w)$ where: E_n is the nitrogen oxides emission limit (expressed as NO_2), ng/J (lb/million Btu) H_{np} is the heat input from combustion of natural gas, H_{do} is the heat input from combustion of distillate oil H_{ro} is the heat input from combustion of residual oil, H_c is the heat input from combustion of coal, H_w is the heat input from combustion of wood residue.	≈50%[1]
≥100mmBTU/hr	$E_n = [(0.036 \text{ lb/mmBTU } H_{np}) + (0.14 \text{ lb/mmBTU } H_{do}) + (0.3 \text{ lb/mmBTU } H_{ro}) + (0.25 \text{ lb/mmBTU } H_c) + (0.2 \text{ lb/mmBTU } H_w)]/(H_{np} + H_{do} + H_{ro} + H_c + H_w)$ where: E_n is the nitrogen oxides emission limit (expressed as NO_2), ng/J (lb/million Btu) H_{np} is the heat input from combustion of natural gas, H_{do} is the heat input from combustion of distillate oil H_{ro} is the heat input from combustion of residual oil, H_c is the heat input from combustion of coal. H_w is the heat input from combustion of wood residue.	≈60%[1]
Wood Residue Boilers		
All types	Combustion controls to minimize NOx emissions or equivalent technology capable of achieving 0.20 lb/mmBTU	0-50%[2]
Coal Fired Stoker Fed Boilers		
< 250 mmBTU/hr	Combustion controls to minimize NOx emissions or equivalent technology capable of achieving 0.35 lb/mmBTU	34%[3]

Refer to the December 2003 Progress Reports submitted by individual areas for additional activities.

≥ 250 mmBTU/hr	Combustion controls to minimize NOx emissions or equivalent technology capable of achieving 0.25 lb/mmBTU	53%[3]
Pulverized Coal Fired Boilers		
< 250 mmBTU/hr	Low NOx Burners + Combustion controls to minimize NOx emissions or equivalent technology capable of achieving 0.35 lb/mmBTU	50%[1]
≥ 250 mmBTU/hr	Low NOx Burners + Combustion controls to minimize NOx emissions + SCR or equivalent technology capable of achieving 0.14 lb/mmBTU	70%+[1]
Municipal refuse fired boilers		
< 250 mmBTU/hr	Combustion modifications to minimize NOx emissions + Flue Gas Recirculation or equivalent technology capable of achieving 200 ppmv @12% CO_2 (0.35 lb/mmBTU)	12%[3]
≥ 250 mmBTU/hr	Staged Combustion and Automatic Combustion Air Control + SCR or equivalent technology capable of achieving 0.18 lb/mmBTU	55%[3]
Internal Combustion Engines		
Compression Ignition	Timing Retard ≤ 4^o + Turbocharger w/ Intercooler or equivalent technology capable of achieving 490 ppmv @ 15% O_2 (7.64 gm/bhp-hr)	20-30%[1]
Spark Ignition	Lean Burn Technology or equivalent technology capable of achieving 1.0 gm/bhp-hr	87%[1]
Landfill or Digester Gas Fired	Lean Burn Technology or equivalent technology capable of achieving 1.25 gm/bhp-hr	≈50%[EST]

Refer to the December 2003 Progress Reports submitted by individual areas for additional activities.

Gas Turbines		
Simple Cycle – Natural Gas		
< 50 Megawatts	Combustion Modifications (e.g. dry low-NOx combustors) to minimize NOx emissions or equivalent technology capable of achieving 25 ppmv @ 15% O_2 Dry (0.054 lb/mmBTU)	81%[4]
≥ 50 Megawatts	Combustion Modifications (e.g. dry low-NOx combustors) to minimize NOx emissions or equivalent technology capable of achieving 9.0 ppmv @ 15% O_2 Dry (0.033 lb/mmBTU)	84%[1]
Combined Cycle – Natural Gas		
< 50 Megawatts	Dry Low-NOx Combustors or equivalent technology capable of achieving 9.0 ppmv @ 15% O_2 Dry (0.033 lb/mmBTU)	84%[1]
≥ 50 Megawatts	Dry Low-NOx Combustors + SCR or equivalent technology Capable of achieving 3.0 ppmv @ 15% O_2 Dry (0.011lb/mmBTU)	94%[1]
Simple Cycle - Distillate oil combustion		
< 50 Megawatts	Combustion Modifications and water injection to minimize NOx emissions or equivalent technology capable of achieving 42 ppmv @ 15% O_2 Dry Basis (0.16 lb/mmBTU)	68%[1]
≥ 50 Megawatts	Combustion Modifications and water injection to minimize NOx emissions or equivalent technology capable of achieving 42 ppmv @ 15% O_2 Dry Basis (0.16 lb/mmBTU)	68%[1]
Combined Cycle - Distillate oil combustion		
< 50 Megawatts	Dry Low-NOx Combustors with water injection, or equivalent technology capable of achieving 42 ppmv @ 15% O_2 Dry Basis (0.16 lb/mmBTU)	68%[1]

Refer to the December 2003 Progress Reports submitted by individual areas for additional activities.

$\geq$ 50 Megawatts	Dry Low-NOx Combustors, water injection, and SCR or Equivalent technology capable of achieving 10.0 ppmv @ 15% O_2 Dry Basis (0.038 lb/mmBTU)	90%[1]
Landfill Gas Fired	Water or steam injection or low NOx turbine design or equivalent technology capable of achieving 25 ppmv @ 15% O_2 (0.097 lb/mmBTU)	48%[4]
Cement Kilns		
All	Low NOx Burner or equivalent technology capable of achieving a 30% reduction from uncontrolled levels	30%
Fluidized Bed Combustion (FBC) Boiler:		
Coal Fired	SNCR- Urea (Selective Noncatalytic Reduction - Urea) capable of achieving 0.07 lbs/mmBTU (51.8 ppm @ 3% oxygen)	75%[1]
Wood Fired	SNCR- Urea (Selective Noncatalytic Reduction - Urea) capable of achieving 0.07 lbs/mmBTU (51.8 ppm @ 3% oxygen)	55%[1]
Recovery Furnaces		
All	4th level or air to recovery furnace/good combustion practices or equivalent technology capable of achieving 100 ppm @8% oxygen	0-30%[5]
Lime Kilns		
All	Combustion controls or equivalent technology capable of achieving 175 ppm @ 10% oxygen	25%[3]
Fuel Combustion Sources Not Otherwise Specified: (Examples include but are not limited to process heaters, dryers, furnaces, ovens, duct burners, incinerators, and smelters)		

Refer to the December 2003 Progress Reports submitted by individual areas for additional activities.

All	Low NOx Burners or equivalent technology capable of achieving 30 ppmv @ 3% O_2 Dry (0.036 lb/mmBTU)	0-60%[1]

[1] – EPA 456/F-99-066R "EPA Technical Bulletin – Nitrogen Oxides (NO_x), Why & How thet are Controlled", Nov. 1999.
[2] – EPA 453/R-94-022 "Alternative Control Techniques Document – NO_x Emissions from Industrial/Commercial/ Institutional Boilers", March 1994
[3] – Compared with emissions from EPA's AP-42 "Compilation of Air Pollutant Emission Factors"
[4] – EPA's "Emission Factor Documentation for AP-42 Section 3.1 Stationary Gas Turbines", April 2000
[5] - Information found on EPA's RACT/BACT/LAER Clearinghouse plus information found in the Willamette PSD permit review (SC).

Utility Reductions from EGUs in the NOx SIP Call

Utility	*1998 Emissions*[1] **(tons/day)**	*2007 Emissions* **(tons/day)**	*2012 Emissions* **(tons/day)**
Progress Energy	13.76	30.97	30.97
SCE&G	147.8	84.06	84.06
Santee Cooper	151.65	21.34	30.97
Duke Power	17.21	13.70	13.70
Total	330.42 tons/day	150.07	159.70
Reduction from 1998 Levels	-	54.6%	51.7%

[1]- Emission data represents modeling episode only.

Note: Data is for the EGU units under the NOx Trading Program Only.

Refer to the December 2003 Progress Reports submitted by individual areas for additional activities.

Reductions from Tier II and Low Sulfur Fuel Regulatory Changes

(For May 1998 Episode & Future Years Using Mobile6 Model)

Year	Mobile On-Road Emissions (tons/day)	% Reduction from 1998 Levels
1998	345	-
2007	153	55.6%
2010	128	62.9%
2012	116	66.3%

Refer to the December 2003 Progress Reports submitted by individual areas for additional activities.